SEQUENCE LISTING

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<120> Paramycobacterial diagnostics and vaccines

<130> P54977US00

<140> US 10/501,127
<141> 2004-07-09

<150> PCT/NL03/00020
<151> 2003-01-13

<150> EP 02075089.9
<151> 2002-01-11

<160> 22

<170> PatentIn version 3.3

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agaggagact tcc gtg ccg aac cga cgc cga cgc aag ctt tcg aca gcc 169
Val Pro Asn Arg Arg Arg Arg Lys Leu Ser Thr Ala
1 5 10

atg agc gcg gtc gcc gcc ctg gca gtg gcg agt cct tgc gca tac ttc 217
Met Ser Ala Val Ala Ala Leu Ala Val Ala Ser Pro Cys Ala Tyr Phe
15 20 25

ctt gtc tac gaa tcg acg gcc ggc aac aag gcg ccc gag cac cac gag 265
Leu Val Tyr Glu Ser Thr Ala Gly Asn Lys Ala Pro Glu His His Glu
30 35 40

ttc aag cag gcc gca gtg atg agc gat ctg ccg ggc gag ctg atg ggt 313
Phe Lys Gln Ala Ala Val Met Ser Asp Leu Pro Gly Glu Leu Met Gly
45 50 55 60

gcg ctg tcg cag ggc ctg tcg cag ttt ggg atc aac ctg ccc ccg gtg 361
Ala Leu Ser Gln Gly Leu Ser Gln Phe Gly Ile Asn Leu Pro Pro Val
65 70 75

ccc gcc ctg agc ggc ggc gcc acc agc act ccc ggt ctg gcc agc ccc 409
Pro Ala Leu Ser Gly Gly Ala Thr Ser Thr Pro Gly Leu Ala Ser Pro
80 85 90

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ggc ctg ggt agc ccc ggc ctg ggc acg ccc ggc ctg gga acg ccg ggc      457
Gly Leu Gly Ser Pro Gly Leu Gly Thr Pro Gly Leu Gly Thr Pro Gly
        95                  100                 105

ctg acc aat ccc ggt ctg acg agc ccc ggt gcg acc agt ccc ggc ctg      505
Leu Thr Asn Pro Gly Leu Thr Ser Pro Gly Ala Thr Ser Pro Gly Leu
    110                 115                 120

acc agt ccc ggc ctg acc agt cct ggt ttg acc agc ccc ggt ctg acc      553
Thr Ser Pro Gly Leu Thr Ser Pro Gly Leu Thr Ser Pro Gly Leu Thr
125                 130                 135                 140

agc ccg ggt gcg gcg ccg acg acg ccc ggg ctc acc gcg ccc ggc gcg      601
Ser Pro Gly Ala Ala Pro Thr Thr Pro Gly Leu Thr Ala Pro Gly Ala
                145                 150                 155

ctg ccg acc acg ccg ggc ggc ggg gtc gcc acc ccc ggc gcc ggg ctc      649
Leu Pro Thr Thr Pro Gly Gly Gly Val Ala Thr Pro Gly Ala Gly Leu
            160                 165                 170

aac ccc gcg ctg tcc aac ccc ggg ctg acc agc ccg gcc ggg acg gcg      697
Asn Pro Ala Leu Ser Asn Pro Gly Leu Thr Ser Pro Ala Gly Thr Ala
        175                 180                 185

ccg ggg ctg ggc agc ccg acc gtg gcg ccg agt gag gtg ccg atc gac      745
Pro Gly Leu Gly Ser Pro Thr Val Ala Pro Ser Glu Val Pro Ile Asp
    190                 195                 200

tcc ggg gcc ggc ctg gac ccg ggc gcc ggt ggc acg tac ccg atc ctg      793
Ser Gly Ala Gly Leu Asp Pro Gly Ala Gly Gly Thr Tyr Pro Ile Leu
205                 210                 215                 220

ggc gac ccg tcg acc ttc ggt aac gcc tcg ccg atc ggc ggc ggt ggc      841
Gly Asp Pro Ser Thr Phe Gly Asn Ala Ser Pro Ile Gly Gly Gly Gly
                225                 230                 235

acc ggt ctg ggc ggc ggc tcg agc tcg ggt ggc agc ggc ggc ctg gtc      889
Thr Gly Leu Gly Gly Gly Ser Ser Ser Gly Gly Ser Gly Gly Leu Val
            240                 245                 250

aac gac gtg atg caa gcc gcc aac cag ctc ggc gcg ggt cag gcg atc      937
Asn Asp Val Met Gln Ala Ala Asn Gln Leu Gly Ala Gly Gln Ala Ile
        255                 260                 265

gac ctg ctc aag ggc ctg gtg atg ccg gcg atc acg cag ggc atg cac      985
Asp Leu Leu Lys Gly Leu Val Met Pro Ala Ile Thr Gln Gly Met His
    270                 275                 280

ggc ggc gcg gcc gcg ggt gct ttg ccc ggc gcg gcc ggt gct ctg ccc     1033
Gly Gly Ala Ala Ala Gly Ala Leu Pro Gly Ala Ala Gly Ala Leu Pro
285                 290                 295                 300

ggc gcg gcc ggc gcc ctg ccc ggt gcg gcc ggc gcc ctg ccg ggt gcg     1081
Gly Ala Ala Gly Ala Leu Pro Gly Ala Ala Gly Ala Leu Pro Gly Ala
                305                 310                 315

gcg ggc gcc gcg ggt gcg ttg ccg gcg gcc gcc ggc gcc gcg ccg gca     1129
Ala Gly Ala Ala Gly Ala Leu Pro Ala Ala Ala Gly Ala Ala Pro Ala
            320                 325                 330

ctg ccc ccg gtc tag acctttttcca aaccatccac cagacggcac c             1175
Leu Pro Pro Val
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<213> Mycobacterium avium

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20 25 30

Ser Thr Ala Gly Asn Lys Ala Pro Glu His His Glu Phe Lys Gln Ala
35 40 45

Ala Val Met Ser Asp Leu Pro Gly Glu Leu Met Gly Ala Leu Ser Gln
50 55 60

Gly Leu Ser Gln Phe Gly Ile Asn Leu Pro Pro Val Pro Ala Leu Ser
65 70 75 80

Gly Gly Ala Thr Ser Thr Pro Gly Leu Ala Ser Pro Gly Leu Gly Ser
85 90 95

Pro Gly Leu Gly Thr Pro Gly Leu Gly Thr Pro Gly Leu Thr Asn Pro
100 105 110

Gly Leu Thr Ser Pro Gly Ala Thr Ser Pro Gly Leu Thr Ser Pro Gly
115 120 125

Leu Thr Ser Pro Gly Leu Thr Ser Pro Gly Leu Thr Ser Pro Gly Ala
130 135 140

Ala Pro Thr Thr Pro Gly Leu Thr Ala Pro Gly Ala Leu Pro Thr Thr
145 150 155 160

Pro Gly Gly Gly Val Ala Thr Pro Gly Ala Gly Leu Asn Pro Ala Leu
165 170 175

Ser Asn Pro Gly Leu Thr Ser Pro Ala Gly Thr Ala Pro Gly Leu Gly
180 185 190

Ser Pro Thr Val Ala Pro Ser Glu Val Pro Ile Asp Ser Gly Ala Gly
195 200 205

Leu Asp Pro Gly Ala Gly Gly Thr Tyr Pro Ile Leu Gly Asp Pro Ser
210 215 220

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Thr Phe Gly Asn Ala Ser Pro Ile Gly Gly Gly Gly Thr Gly Leu Gly
225                 230                 235                 240

Gly Gly Ser Ser Ser Gly Gly Ser Gly Gly Leu Val Asn Asp Val Met
                245                 250                 255

Gln Ala Ala Asn Gln Leu Gly Ala Gly Gln Ala Ile Asp Leu Leu Lys
            260                 265                 270

Gly Leu Val Met Pro Ala Ile Thr Gln Gly Met His Gly Gly Ala Ala
        275                 280                 285

Ala Gly Ala Leu Pro Gly Ala Ala Gly Ala Leu Pro Gly Ala Ala Gly
    290                 295                 300

Ala Leu Pro Gly Ala Ala Gly Ala Leu Pro Gly Ala Ala Gly Ala Ala
305                 310                 315                 320

Gly Ala Leu Pro Ala Ala Ala Gly Ala Ala Pro Ala Leu Pro Pro Val
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<213> Mycobacterium avium

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cagggc atg tcc cgt ttg tca ttt gtc tgc agg ctt ttg gcc gca acc        108
       Met Ser Arg Leu Ser Phe Val Cys Arg Leu Leu Ala Ala Thr
       1               5                   10

gct ttc gcc gtc gcc ctg cta ctc ggg ctg ggc gac gtg ccg cgc gcg      156
Ala Phe Ala Val Ala Leu Leu Leu Gly Leu Gly Asp Val Pro Arg Ala
15                  20                  25                  30

gcg gcc acc gac gac cgc ctg caa ttc acc gcg acc acg ctc agc ggc      204
Ala Ala Thr Asp Asp Arg Leu Gln Phe Thr Ala Thr Thr Leu Ser Gly
                35                  40                  45

gcg ccg ttc aac ggc gcc agt ctg cag ggc aag ccc gcc gtg ctg tgg      252
Ala Pro Phe Asn Gly Ala Ser Leu Gln Gly Lys Pro Ala Val Leu Trp
            50                  55                  60

ttc tgg acg ccg tgg tgc ccg tac tgc aac gcc gag gcc ccg ggc gtg      300
Phe Trp Thr Pro Trp Cys Pro Tyr Cys Asn Ala Glu Ala Pro Gly Val
        65                  70                  75

agc cgg gtg gcc gcc gcc aac ccg ggc gtc acc ttc gtc ggc gtc gcc      348
Ser Arg Val Ala Ala Ala Asn Pro Gly Val Thr Phe Val Gly Val Ala
    80                  85                  90
```

```
gcc cac tcc gaa gtc ggc gcc atg gcc aac ttc gtc tcc aag tac aac      396
Ala His Ser Glu Val Gly Ala Met Ala Asn Phe Val Ser Lys Tyr Asn
95                  100                 105                 110

ctg aac ttc acc acg ctc aac gac gcc gac ggc gcg atc tgg gcc cgc      444
Leu Asn Phe Thr Thr Leu Asn Asp Ala Asp Gly Ala Ile Trp Ala Arg
                115                 120                 125

tac ggc gtg ccc tgg cag ccc gcg tac gtg ttc tac cgg gcg gac ggc      492
Tyr Gly Val Pro Trp Gln Pro Ala Tyr Val Phe Tyr Arg Ala Asp Gly
            130                 135                 140

agc tcc acc ttc gtc aac aac ccc acc tcg gcg atg ccc cag gac gaa      540
Ser Ser Thr Phe Val Asn Asn Pro Thr Ser Ala Met Pro Gln Asp Glu
        145                 150                 155

ctg gcc gcc cgg gtg gcg gcg ctg cgc tgacgtggac cgcggtctgg            587
Leu Ala Ala Arg Val Ala Ala Leu Arg
    160                 165
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<210> 4
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<213> Mycobacterium avium

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Met Ser Arg Leu Ser Phe Val Cys Arg Leu Leu Ala Ala Thr Ala Phe
1               5                   10                  15

Ala Val Ala Leu Leu Leu Gly Leu Gly Asp Val Pro Arg Ala Ala Ala
            20                  25                  30

Thr Asp Asp Arg Leu Gln Phe Thr Ala Thr Thr Leu Ser Gly Ala Pro
        35                  40                  45

Phe Asn Gly Ala Ser Leu Gln Gly Lys Pro Ala Val Leu Trp Phe Trp
    50                  55                  60

Thr Pro Trp Cys Pro Tyr Cys Asn Ala Glu Ala Pro Gly Val Ser Arg
65                  70                  75                  80

Val Ala Ala Ala Asn Pro Gly Val Thr Phe Val Gly Val Ala Ala His
                85                  90                  95

Ser Glu Val Gly Ala Met Ala Asn Phe Val Ser Lys Tyr Asn Leu Asn
            100                 105                 110

Phe Thr Thr Leu Asn Asp Ala Asp Gly Ala Ile Trp Ala Arg Tyr Gly
        115                 120                 125

Val Pro Trp Gln Pro Ala Tyr Val Phe Tyr Arg Ala Asp Gly Ser Ser
    130                 135                 140
```

```
Thr Phe Val Asn Asn Pro Thr Ser Ala Met Pro Gln Asp Glu Leu Ala
145                 150                 155                 160

Ala Arg Val Ala Ala Leu Arg
                165
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                                      Met Arg Leu Ser Leu Ser Lys
                                      1               5

ttg ggc gtt gcg gtg ggc agc gcg gca gtg gca ttg acc gcc gcg gcc      102
Leu Gly Val Ala Val Gly Ser Ala Ala Val Ala Leu Thr Ala Ala Ala
        10                  15                  20

ggt gtc gca tcc gcc gac ccc atg gac gcg atc atc aac acc acc tgc      150
Gly Val Ala Ser Ala Asp Pro Met Asp Ala Ile Ile Asn Thr Thr Cys
    25                  30                  35

aac tac ggg cag gtg atc gcc gcg ctg aac gcg tcc gac ccg gcg gct      198
Asn Tyr Gly Gln Val Ile Ala Ala Leu Asn Ala Ser Asp Pro Ala Ala
40                  45                  50                  55

gcc cag cag ctg aac tcg tcg ccg atg gcg cag tcc tac atc cag cgg      246
Ala Gln Gln Leu Asn Ser Ser Pro Met Ala Gln Ser Tyr Ile Gln Arg
                60                  65                  70

ttc ctg gcc tcc ccg ccg gcg aag cgt cag cag atg gcc cag cag atc      294
Phe Leu Ala Ser Pro Pro Ala Lys Arg Gln Gln Met Ala Gln Gln Ile
            75                  80                  85

cag ggc atg ccg gcc gcg cag cag tac atc aac gac atc aac cag gtc      342
Gln Gly Met Pro Ala Ala Gln Gln Tyr Ile Asn Asp Ile Asn Gln Val
        90                  95                  100

gcg gtc acc tgt aac aac ttc tga                                     366
Ala Val Thr Cys Asn Asn Phe
    105                 110
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<210> 6
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<213> Mycobacterium avium

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Met Arg Leu Ser Leu Ser Lys Leu Gly Val Ala Val Gly Ser Ala Ala
1               5                   10                  15
```

```
Val Ala Leu Thr Ala Ala Ala Gly Val Ala Ser Ala Asp Pro Met Asp
            20                  25                  30

Ala Ile Ile Asn Thr Thr Cys Asn Tyr Gly Gln Val Ile Ala Ala Leu
        35                  40                  45

Asn Ala Ser Asp Pro Ala Ala Ala Gln Gln Leu Asn Ser Ser Pro Met
    50                  55                  60

Ala Gln Ser Tyr Ile Gln Arg Phe Leu Ala Ser Pro Pro Ala Lys Arg
65                  70                  75                  80

Gln Gln Met Ala Gln Gln Ile Gln Gly Met Pro Ala Ala Gln Gln Tyr
                85                  90                  95

Ile Asn Asp Ile Asn Gln Val Ala Val Thr Cys Asn Asn Phe
            100                 105                 110


<210>  7
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<212>  DNA
<213>  Mycobacterium avium


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<222>  (46)..(1410)

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                                                 Val Ala Pro Lys
                                                 1

gtc tcg tcc gat ctg ttc tcg cag att gtc aat tcc ggt cct gga tcg     105
Val Ser Ser Asp Leu Phe Ser Gln Ile Val Asn Ser Gly Pro Gly Ser
5                   10                  15                  20

ttt ctc gcc aag cag ctc ggc gtc ccg caa ccc gag acg ctg cgc cgc     153
Phe Leu Ala Lys Gln Leu Gly Val Pro Gln Pro Glu Thr Leu Arg Arg
                25                  30                  35

tac cgg ccc ggt gac ccg ccg ctg gcc ggg tcg ctg ctg atc ggc ggc     201
Tyr Arg Pro Gly Asp Pro Pro Leu Ala Gly Ser Leu Leu Ile Gly Gly
            40                  45                  50

gag ggc cgc gtg gtc gag ccg ctg cgg gcg gcg ctg gcc aag gac tac     249
Glu Gly Arg Val Val Glu Pro Leu Arg Ala Ala Leu Ala Lys Asp Tyr
        55                  60                  65

gac ctg gtc ggc aac aac ctg ggc ggg cgc tgg gcc gac cgg ttc ggc     297
Asp Leu Val Gly Asn Asn Leu Gly Gly Arg Trp Ala Asp Arg Phe Gly
    70                  75                  80

ggg ctg gtc ttc gac gcc acc ggg atc acc acc ccg gag ggc ctg aag     345
Gly Leu Val Phe Asp Ala Thr Gly Ile Thr Thr Pro Glu Gly Leu Lys
85                  90                  95                  100

ggg ctg tac gag ttc ttc acc cca ctg ctg cgc aac ctg ggt cac tgc     393
```

```
Gly Leu Tyr Glu Phe Phe Thr Pro Leu Leu Arg Asn Leu Gly His Cys
                105                 110                 115

gcc cgc gtg gtg gtg gtc ggc acc acg ccc gac gcc gcc gcc ggc ccg      441
Ala Arg Val Val Val Val Gly Thr Thr Pro Asp Ala Ala Ala Gly Pro
            120                 125                 130

cac gag cgg atc gcc cag cgc gcc ctg gag ggc ttc acc cgg tca ttg      489
His Glu Arg Ile Ala Gln Arg Ala Leu Glu Gly Phe Thr Arg Ser Leu
        135                 140                 145

ggc aag gag ctg cgc aac ggc tcg acg gtg gcg ctg gtg tac ctg tcg      537
Gly Lys Glu Leu Arg Asn Gly Ser Thr Val Ala Leu Val Tyr Leu Ser
    150                 155                 160

ccg gcc gcc aaa ccc gcc gcg acg ggc ctg gag tcg acc atg cgg ttc      585
Pro Ala Ala Lys Pro Ala Ala Thr Gly Leu Glu Ser Thr Met Arg Phe
165                 170                 175                 180

atc ctg tcg gcc aag tcc gcc tac gtc gac ggc cag gtc ttc tac gtc      633
Ile Leu Ser Ala Lys Ser Ala Tyr Val Asp Gly Gln Val Phe Tyr Val
                185                 190                 195

ggc gag gcc gac tcc acc ccc ccg gcg gac tgg gaa cgg ccg ctg gac      681
Gly Glu Ala Asp Ser Thr Pro Pro Ala Asp Trp Glu Arg Pro Leu Asp
            200                 205                 210

ggc aag gtc gcc atc gtg acc ggt gcg gcc cgc gga atc ggc gcc acg      729
Gly Lys Val Ala Ile Val Thr Gly Ala Ala Arg Gly Ile Gly Ala Thr
        215                 220                 225

atc gcc gag gtg ttc gcc cgc gac ggc gcc cgc gtg gtc gcg atc gac      777
Ile Ala Glu Val Phe Ala Arg Asp Gly Ala Arg Val Val Ala Ile Asp
    230                 235                 240

gtg gaa tcg gcc gcc gag acg ctg gcc gag acg gcc agc cgg gtc ggc      825
Val Glu Ser Ala Ala Glu Thr Leu Ala Glu Thr Ala Ser Arg Val Gly
245                 250                 255                 260

ggc acc gcg ctg tgg ctc gac gtc acc gcc ccc gac gcc gtc gac aag      873
Gly Thr Ala Leu Trp Leu Asp Val Thr Ala Pro Asp Ala Val Asp Lys
                265                 270                 275

atc acc gag cac ctg cgc gag cac cac ggc ggt cac gcc gac atc ctg      921
Ile Thr Glu His Leu Arg Glu His His Gly Gly His Ala Asp Ile Leu
            280                 285                 290

gtc aac aac gcc ggg atc acc cgc gac aag ctg ctg gcc aac atg gac      969
Val Asn Asn Ala Gly Ile Thr Arg Asp Lys Leu Leu Ala Asn Met Asp
        295                 300                 305

gac gcg cgc tgg gac gcc gtg ttg gcc gtg aat ctg ctt gcc cca ctt     1017
Asp Ala Arg Trp Asp Ala Val Leu Ala Val Asn Leu Leu Ala Pro Leu
    310                 315                 320

cgc ctt acc gaa ggg ctg gtg ggc aac ggc agc atc ggc gaa ggc ggc     1065
Arg Leu Thr Glu Gly Leu Val Gly Asn Gly Ser Ile Gly Glu Gly Gly
325                 330                 335                 340

cgc atc gtc ggc ctt tcg tcg atg gcc ggc atc gcg ggc aac cgc ggc     1113
Arg Ile Val Gly Leu Ser Ser Met Ala Gly Ile Ala Gly Asn Arg Gly
                345                 350                 355

cag acc aac tac gcc acc acc aag gca ggc atg atc ggc ctc acc cag     1161
```

```
Gln Thr Asn Tyr Ala Thr Thr Lys Ala Gly Met Ile Gly Leu Thr Gln
            360                 365                 370

gcg ctg gcg ccg gag ctc tac gac aag ggc atc acc atc aac gcc gtc     1209
Ala Leu Ala Pro Glu Leu Tyr Asp Lys Gly Ile Thr Ile Asn Ala Val
        375                 380                 385

gcg ccg gga ttc atc gag acc cag atg acg gcc gcc atc ccg ctg gcc     1257
Ala Pro Gly Phe Ile Glu Thr Gln Met Thr Ala Ala Ile Pro Leu Ala
    390                 395                 400

acc cgc gag gtg ggg cgc cgg atg aac tcg ctg ctg cag ggc ggg cag     1305
Thr Arg Glu Val Gly Arg Arg Met Asn Ser Leu Leu Gln Gly Gly Gln
405                 410                 415                 420

ccg gtg gac gtc gcc gaa acc atc gcc tac ttc gcc agc ccg gcg tcg     1353
Pro Val Asp Val Ala Glu Thr Ile Ala Tyr Phe Ala Ser Pro Ala Ser
                425                 430                 435

aac gcg gtg acc ggc aac gtc atc cgg gtc tgc ggc cag gcg atg ctg     1401
Asn Ala Val Thr Gly Asn Val Ile Arg Val Cys Gly Gln Ala Met Leu
            440                 445                 450

ggg gca tga                                                        1410
Gly Ala
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<210> 8
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<212> PRT
<213> Mycobacterium avium

<400> 8

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Val Ala Pro Lys Val Ser Ser Asp Leu Phe Ser Gln Ile Val Asn Ser
1               5                   10                  15

Gly Pro Gly Ser Phe Leu Ala Lys Gln Leu Gly Val Pro Gln Pro Glu
            20                  25                  30

Thr Leu Arg Arg Tyr Arg Pro Gly Asp Pro Pro Leu Ala Gly Ser Leu
        35                  40                  45

Leu Ile Gly Gly Glu Gly Arg Val Val Glu Pro Leu Arg Ala Ala Leu
    50                  55                  60

Ala Lys Asp Tyr Asp Leu Val Gly Asn Asn Leu Gly Gly Arg Trp Ala
65                  70                  75                  80

Asp Arg Phe Gly Gly Leu Val Phe Asp Ala Thr Gly Ile Thr Thr Pro
                85                  90                  95

Glu Gly Leu Lys Gly Leu Tyr Glu Phe Phe Thr Pro Leu Leu Arg Asn
            100                 105                 110

Leu Gly His Cys Ala Arg Val Val Val Val Gly Thr Thr Pro Asp Ala
```

115 120 125

Ala Ala Gly Pro His Glu Arg Ile Ala Gln Arg Ala Leu Glu Gly Phe
130 135 140

Thr Arg Ser Leu Gly Lys Glu Leu Arg Asn Gly Ser Thr Val Ala Leu
145 150 155 160

Val Tyr Leu Ser Pro Ala Ala Lys Pro Ala Ala Thr Gly Leu Glu Ser
165 170 175

Thr Met Arg Phe Ile Leu Ser Ala Lys Ser Ala Tyr Val Asp Gly Gln
180 185 190

Val Phe Tyr Val Gly Glu Ala Asp Ser Thr Pro Pro Ala Asp Trp Glu
195 200 205

Arg Pro Leu Asp Gly Lys Val Ala Ile Val Thr Gly Ala Ala Arg Gly
210 215 220

Ile Gly Ala Thr Ile Ala Glu Val Phe Ala Arg Asp Gly Ala Arg Val
225 230 235 240

Val Ala Ile Asp Val Glu Ser Ala Ala Glu Thr Leu Ala Glu Thr Ala
245 250 255

Ser Arg Val Gly Gly Thr Ala Leu Trp Leu Asp Val Thr Ala Pro Asp
260 265 270

Ala Val Asp Lys Ile Thr Glu His Leu Arg Glu His His Gly Gly His
275 280 285

Ala Asp Ile Leu Val Asn Asn Ala Gly Ile Thr Arg Asp Lys Leu Leu
290 295 300

Ala Asn Met Asp Asp Ala Arg Trp Asp Ala Val Leu Ala Val Asn Leu
305 310 315 320

Leu Ala Pro Leu Arg Leu Thr Glu Gly Leu Val Gly Asn Gly Ser Ile
325 330 335

Gly Glu Gly Gly Arg Ile Val Gly Leu Ser Ser Met Ala Gly Ile Ala
340 345 350

Gly Asn Arg Gly Gln Thr Asn Tyr Ala Thr Thr Lys Ala Gly Met Ile
355 360 365

Gly Leu Thr Gln Ala Leu Ala Pro Glu Leu Tyr Asp Lys Gly Ile Thr

370 375 380

Ile Asn Ala Val Ala Pro Gly Phe Ile Glu Thr Gln Met Thr Ala Ala
385 390 395 400

Ile Pro Leu Ala Thr Arg Glu Val Gly Arg Arg Met Asn Ser Leu Leu
405 410 415

Gln Gly Gly Gln Pro Val Asp Val Ala Glu Thr Ile Ala Tyr Phe Ala
420 425 430

Ser Pro Ala Ser Asn Ala Val Thr Gly Asn Val Ile Arg Val Cys Gly
435 440 445

Gln Ala Met Leu Gly Ala
450

<210> 9
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<212> DNA
<213> Mycobacterium avium

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<223> n is a, c, g, or t

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<222> (619)..(619)
<223> n is a, c, g, or t

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gtcaatccgg atcggacccc aacgtcgact tgtgggcgcc aattcgcggg ttttcgccca 120

gcaagtcgac gttcggcgcg aatcggtgag gtgggcacag gtgaatgacg aagaggac 178

atg ctg gtc gcc acg gtg cgg gcg ttc atc gac cgc gag gtc aaa ccg 226
Met Leu Val Ala Thr Val Arg Ala Phe Ile Asp Arg Glu Val Lys Pro
1 5 10 15

acc gtg cgc gag gtg gag cac gcc gat gcc tat ccc gag gcg tgg atc 274
Thr Val Arg Glu Val Glu His Ala Asp Ala Tyr Pro Glu Ala Trp Ile
20 25 30

gag cag atg aag cgg atc ggg atc tac ggg ctg gcg gtg ccc gag gaa 322
Glu Gln Met Lys Arg Ile Gly Ile Tyr Gly Leu Ala Val Pro Glu Glu
35 40 45

tac ggt ggt tcg ccg gtg tcc atg ccg tgc tac gtg cgg gtc acc gag 370
Tyr Gly Gly Ser Pro Val Ser Met Pro Cys Tyr Val Arg Val Thr Glu

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    50                  55                  60

cag ctg gcg cgc ggc tgg atg agc ctg gcc ggg gcg atg ggc ggg cac      418
Gln Leu Ala Arg Gly Trp Met Ser Leu Ala Gly Ala Met Gly Gly His
65                  70                  75                  80

acc gtg gtg gcc aag ctg cta acg ctg ttc ggc acc gag gac cas aag      466
Thr Val Val Ala Lys Leu Leu Thr Leu Phe Gly Thr Glu Asp Xaa Lys
                85                  90                  95

cgg gcc tac ctg ccg cgg atg gcc agc ggc gaa atc cgg gcc acc atg      514
Arg Ala Tyr Leu Pro Arg Met Ala Ser Gly Glu Ile Arg Ala Thr Met
            100                 105                 110

gcg ttg acc gag ccc sgc ggc ggc tcg gac ctg cag aac atg tcg acc      562
Ala Leu Thr Glu Pro Xaa Gly Gly Ser Asp Leu Gln Asn Met Ser Thr
        115                 120                 125

acc gcg ctg ccc gac ccc gac tcc gac ggn ctg gtg gtc aac ggg gcc      610
Thr Ala Leu Pro Asp Pro Asp Ser Asp Gly Leu Val Val Asn Gly Ala
    130                 135                 140

aag acc tgn atc aac                                                  625
Lys Thr Xaa Ile Asn
145
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<210> 10
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<213> Mycobacterium avium

<220>
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<222> (95)..(95)
<223> The 'Xaa' at location 95 stands for Gln, or His.

<220>
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<222> (118)..(118)
<223> The 'Xaa' at location 118 stands for Gly, or Arg.

<220>
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<222> (147)..(147)
<223> The 'Xaa' at location 147 stands for Trp, or Cys.

<400> 10

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Met Leu Val Ala Thr Val Arg Ala Phe Ile Asp Arg Glu Val Lys Pro
1               5                   10                  15

Thr Val Arg Glu Val Glu His Ala Asp Ala Tyr Pro Glu Ala Trp Ile
            20                  25                  30

Glu Gln Met Lys Arg Ile Gly Ile Tyr Gly Leu Ala Val Pro Glu Glu
        35                  40                  45

Tyr Gly Gly Ser Pro Val Ser Met Pro Cys Tyr Val Arg Val Thr Glu
    50                  55                  60
```

Gln Leu Ala Arg Gly Trp Met Ser Leu Ala Gly Ala Met Gly Gly His
65 70 75 80

Thr Val Val Ala Lys Leu Leu Thr Leu Phe Gly Thr Glu Asp Xaa Lys
85 90 95

Arg Ala Tyr Leu Pro Arg Met Ala Ser Gly Glu Ile Arg Ala Thr Met
100 105 110

Ala Leu Thr Glu Pro Xaa Gly Gly Ser Asp Leu Gln Asn Met Ser Thr
115 120 125

Thr Ala Leu Pro Asp Pro Asp Ser Asp Gly Leu Val Val Asn Gly Ala
130 135 140

Lys Thr Xaa Ile Asn
145

<210> 11
<211> 241
<212> DNA
<213> Mycobacterium avium

<220>
<221> CDS
<222> (147)..(239)

<400> 11
gtgggggcaa gccaattacg ttcgcatcga cccggcacag gcggtcgctc acgtcatcaa 60

catgccgctc atccccgatg aggctcgaat gaccttgcta cgcaggcgct gaacgcacga 120

cgaaacggac cggaggtgaa agggac atg agc cac gcc gat caa ctc gct cgg 173
Met Ser His Ala Asp Gln Leu Ala Arg
1 5

acg cac ctg gcg ccc gat cct gcg gac ctg tcg cgc ctg gtc gcc ggc 221
Thr His Leu Ala Pro Asp Pro Ala Asp Leu Ser Arg Leu Val Ala Gly
10 15 20 25

acc cac cac gac ccg cac gg 241
Thr His His Asp Pro His
30

<210> 12
<211> 31
<212> PRT
<213> Mycobacterium avium

<400> 12

Met Ser His Ala Asp Gln Leu Ala Arg Thr His Leu Ala Pro Asp Pro
1 5 10 15

Ala Asp Leu Ser Arg Leu Val Ala Gly Thr His His Asp Pro His
20 25 30

<210> 13
<211> 236
<212> DNA
<213> Mycobacterium avium

<220>
<221> CDS
<222> (8)..(214)

<400> 13
ggacacc aac gtg acc ggg gtg ttt ctc acc gcc cag gcg gcg gcc cgg 49
Asn Val Thr Gly Val Phe Leu Thr Ala Gln Ala Ala Ala Arg
1 5 10

gcg atg atg cgg cag ggc cgc ggc ggc gcc atc atc acc acc gcc tcg 97
Ala Met Met Arg Gln Gly Arg Gly Gly Ala Ile Ile Thr Thr Ala Ser
15 20 25 30

atg tcc ggg cac atc atc aac gtc ccg cag cag gtc ggc cac tac tgc 145
Met Ser Gly His Ile Ile Asn Val Pro Gln Gln Val Gly His Tyr Cys
35 40 45

gcc agc aag gcg gcc gtg atc cag ctg acc aag gcc atg gcc gtc gaa 193
Ala Ser Lys Ala Ala Val Ile Gln Leu Thr Lys Ala Met Ala Val Glu
50 55 60

ttc tgc agg atc cgt cga ctc tagactcgag caagcttatg ca 236
Phe Cys Arg Ile Arg Arg Leu
65

<210> 14
<211> 69
<212> PRT
<213> Mycobacterium avium

<400> 14

Asn Val Thr Gly Val Phe Leu Thr Ala Gln Ala Ala Ala Arg Ala Met
1 5 10 15

Met Arg Gln Gly Arg Gly Gly Ala Ile Ile Thr Thr Ala Ser Met Ser
20 25 30

Gly His Ile Ile Asn Val Pro Gln Gln Val Gly His Tyr Cys Ala Ser
35 40 45

Lys Ala Ala Val Ile Gln Leu Thr Lys Ala Met Ala Val Glu Phe Cys
50 55 60

Arg Ile Arg Arg Leu
65

<210> 15

<211> 419
<212> DNA
<213> Mycobacterium avium

<220>
<221> CDS
<222> (25)..(417)

<220>
<221> misc_feature
<222> (331)..(331)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (398)..(398)
<223> n is a, c, g, or t

<400> 15

```
cggccaccgc acccagggga ggcc atg act cac acc aag gcc ggt cgt gcc        51
                           Met Thr His Thr Lys Ala Gly Arg Ala
                           1               5

gcg tgg ccg gcc gcc tgc gcg gtc gtc ctg tcc gcc gcc gcg ctg ttg        99
Ala Trp Pro Ala Ala Cys Ala Val Val Leu Ser Ala Ala Ala Leu Leu
10                  15                  20                  25

tgc gcg gca gcg gcc gcc gcg gac gaa gcc gat gac gcg ttc ctc gcc       147
Cys Ala Ala Ala Ala Ala Ala Asp Glu Ala Asp Asp Ala Phe Leu Ala
                30                  35                  40

ggc ctg gcc aag ggc ggg atc acc atg ttc gac gac gac gac gcg atc       195
Gly Leu Ala Lys Gly Gly Ile Thr Met Phe Asp Asp Asp Asp Ala Ile
            45                  50                  55

gcc atg ggc cac agc gtg tgc tcg agc atc gac gcc aac ccc aac gtg       243
Ala Met Gly His Ser Val Cys Ser Ser Ile Asp Ala Asn Pro Asn Val
        60                  65                  70

tcg atg ctg gcg ctg cgg ctg acc aag caa acc ccg ttg acg ccg aag       291
Ser Met Leu Ala Leu Arg Leu Thr Lys Gln Thr Pro Leu Thr Pro Lys
    75                  80                  85

caa tcc ggc tac ttc atc ggt ctt tcg gtc gcc agc tac ntg ccc gca       339
Gln Ser Gly Tyr Phe Ile Gly Leu Ser Val Ala Ser Tyr Xaa Pro Ala
90                  95                  100                 105

gta caa gga cga cgt cga ccc ctc gct ggg ctg gct gat ccc gcc gcc       387
Val Gln Gly Arg Arg Arg Pro Leu Ala Gly Leu Ala Asp Pro Ala Ala
                110                 115                 120

gct gat gtg ang ttg ccg gcc ggc atc ggc gt                           419
Ala Asp Val Xaa Leu Pro Ala Gly Ile Gly
            125                 130
```

<210> 16
<211> 131
<212> PRT
<213> Mycobacterium avium

<220>
<221> misc_feature

<222> (103)..(103)
<223> The 'Xaa' at location 103 stands for Met, Val, or Leu.

<220>
<221> misc_feature
<222> (125)..(125)
<223> The 'Xaa' at location 125 stands for Lys, Arg, Thr, or Met.

<400> 16

Met Thr His Thr Lys Ala Gly Arg Ala Ala Trp Pro Ala Ala Cys Ala
1 5 10 15

Val Val Leu Ser Ala Ala Ala Leu Leu Cys Ala Ala Ala Ala Ala Ala
20 25 30

Asp Glu Ala Asp Asp Ala Phe Leu Ala Gly Leu Ala Lys Gly Gly Ile
35 40 45

Thr Met Phe Asp Asp Asp Asp Ala Ile Ala Met Gly His Ser Val Cys
50 55 60

Ser Ser Ile Asp Ala Asn Pro Asn Val Ser Met Leu Ala Leu Arg Leu
65 70 75 80

Thr Lys Gln Thr Pro Leu Thr Pro Lys Gln Ser Gly Tyr Phe Ile Gly
85 90 95

Leu Ser Val Ala Ser Tyr Xaa Pro Ala Val Gln Gly Arg Arg Arg Pro
100 105 110

Leu Ala Gly Leu Ala Asp Pro Ala Ala Ala Asp Val Xaa Leu Pro Ala
115 120 125

Gly Ile Gly
130

<210> 17
<211> 392
<212> DNA
<213> Mycobacterium avium

<220>
<223> Paratuberculosis protein gene

<220>
<221> CDS
<222> (94)..(390)

<400> 17
cggcgtagca tcgtcaagtc gttgcccgcg ctgatgccgg agcggcagta aggagttcgg 60

ctggtgcaaa aacgcttgcc cacagtcgtt ttg gtg ctg acg gcc gtt gtc gcc 114
Val Leu Thr Ala Val Val Ala

```
                                    1               5

ggt atc gcc ggg tgc agc gcg gcg cag acc gtg ccg cgc aag gcc gcc      162
Gly Ile Ala Gly Cys Ser Ala Ala Gln Thr Val Pro Arg Lys Ala Ala
        10                  15                  20

cgg ctg acc atc gac ggt gcc acc cac acg acc cgc ccg ccg tcc tgc      210
Arg Leu Thr Ile Asp Gly Ala Thr His Thr Thr Arg Pro Pro Ser Cys
    25                  30                  35

cgg cag gac cag atg tat cgg acc atc aac atc ccc gac cac gac ggt      258
Arg Gln Asp Gln Met Tyr Arg Thr Ile Asn Ile Pro Asp His Asp Gly
40                  45                  50                  55

gga gtc gaa gcg gtg gtg ctg ctc agc ggt tac cgg gtg atg ccg cag      306
Gly Val Glu Ala Val Val Leu Leu Ser Gly Tyr Arg Val Met Pro Gln
                60                  65                  70

tgg gtg aag atc cgg aac gtc gac ggc ttc acc ggc agt cta ctg gcc      354
Trp Val Lys Ile Arg Asn Val Asp Gly Phe Thr Gly Ser Leu Leu Ala
            75                  80                  85

asg gcg gag tgg gcg acg cgc acg tcg atc tca cma at                  392
Xaa Ala Glu Trp Ala Thr Arg Thr Ser Ile Ser Xaa
        90                  95
```

<210> 18
<211> 99
<212> PRT
<213> Mycobacterium avium

<220>
<221> misc_feature
<222> (88)..(88)
<223> The 'Xaa' at location 88 stands for Arg, or Thr.

<220>
<221> misc_feature
<222> (99)..(99)
<223> The 'Xaa' at location 99 stands for Gln, or Pro.

<400> 18

```
Val Leu Thr Ala Val Val Ala Gly Ile Ala Gly Cys Ser Ala Ala Gln
1               5                   10                  15

Thr Val Pro Arg Lys Ala Ala Arg Leu Thr Ile Asp Gly Ala Thr His
            20                  25                  30

Thr Thr Arg Pro Pro Ser Cys Arg Gln Asp Gln Met Tyr Arg Thr Ile
        35                  40                  45

Asn Ile Pro Asp His Asp Gly Gly Val Glu Ala Val Val Leu Leu Ser
    50                  55                  60

Gly Tyr Arg Val Met Pro Gln Trp Val Lys Ile Arg Asn Val Asp Gly
65                  70                  75                  80
```

Phe Thr Gly Ser Leu Leu Ala Xaa Ala Glu Trp Ala Thr Arg Thr Ser
85 90 95

Ile Ser Xaa

<210> 19
<211> 1884
<212> DNA
<213> Mycobacterium avium

<220>
<221> CDS
<222> (13)..(1884)

<400> 19
taaccaggag ca atg gct cgt gcg gtc ggt atc gac ctc ggg acc acc aac 51
Met Ala Arg Ala Val Gly Ile Asp Leu Gly Thr Thr Asn
1 5 10

tcc gtc gtc gca gtc ctc gag ggc ggt gac ccc gtc gtc gtc gcc aac 99
Ser Val Val Ala Val Leu Glu Gly Gly Asp Pro Val Val Val Ala Asn
15 20 25

tcc gag ggc tcg cgg acc acc ccg tcc atc gtc gcg ttc gcc cgc aac 147
Ser Glu Gly Ser Arg Thr Thr Pro Ser Ile Val Ala Phe Ala Arg Asn
30 35 40 45

ggc gag gtg ctc gtc ggc cag ccc gcc aag aac cag gcg gtg acc aac 195
Gly Glu Val Leu Val Gly Gln Pro Ala Lys Asn Gln Ala Val Thr Asn
50 55 60

gtc gac cgc acc atc cgt tcg gtc aag cgg cac atg ggc acc gac tgg 243
Val Asp Arg Thr Ile Arg Ser Val Lys Arg His Met Gly Thr Asp Trp
65 70 75

tcc atc gag atc gac ggc aag aaa tac acc gct cag gag atc agc gcc 291
Ser Ile Glu Ile Asp Gly Lys Lys Tyr Thr Ala Gln Glu Ile Ser Ala
80 85 90

cgc gtg ctg atg aag ctc aag cgc gac gcc gag gcc tat ctg ggt gag 339
Arg Val Leu Met Lys Leu Lys Arg Asp Ala Glu Ala Tyr Leu Gly Glu
95 100 105

gac atc acc gac gcg gtc atc acc gta ccg gcg tac ttc aac gac gcc 387
Asp Ile Thr Asp Ala Val Ile Thr Val Pro Ala Tyr Phe Asn Asp Ala
110 115 120 125

cag cgt cag gcg acc aag gaa gcc ggc cag atc gcc ggc ctc aac gtg 435
Gln Arg Gln Ala Thr Lys Glu Ala Gly Gln Ile Ala Gly Leu Asn Val
130 135 140

ctg cgc atc gtc aac gag ccg acc gcg gcc gcg ctg gcc tac ggc ctg 483
Leu Arg Ile Val Asn Glu Pro Thr Ala Ala Ala Leu Ala Tyr Gly Leu
145 150 155

gac aag ggc gag aag gag cag acc atc ctg gtc ttc gac ctc ggc ggc 531
Asp Lys Gly Glu Lys Glu Gln Thr Ile Leu Val Phe Asp Leu Gly Gly
160 165 170

ggc acg ttc gac gtt tcg ctg ctc gag atc ggc gag ggt gtg gtc gag 579

```
Gly Thr Phe Asp Val Ser Leu Leu Glu Ile Gly Glu Gly Val Val Glu
    175                 180                 185

gtc cgc gcc acc agc ggt gac aac caa ctc ggt ggc gac gac tgg gac      627
Val Arg Ala Thr Ser Gly Asp Asn Gln Leu Gly Gly Asp Asp Trp Asp
190                 195                 200                 205

gac cgg atc gtc aac tgg ctg gtc gac aag ttc aag ggc acc agc ggc      675
Asp Arg Ile Val Asn Trp Leu Val Asp Lys Phe Lys Gly Thr Ser Gly
                210                 215                 220

atc gac ctg acc aag gac aag atg gcc atg cag cgg ctg cgt gag gcc      723
Ile Asp Leu Thr Lys Asp Lys Met Ala Met Gln Arg Leu Arg Glu Ala
            225                 230                 235

gcc gag aag gcc aag atc gag ttg tcc agc tcg cag agc acc tcg atc      771
Ala Glu Lys Ala Lys Ile Glu Leu Ser Ser Ser Gln Ser Thr Ser Ile
        240                 245                 250

aac ctg ccc tac atc acc gtc gac gcg gac aag aac ccg ctg ttc ctc      819
Asn Leu Pro Tyr Ile Thr Val Asp Ala Asp Lys Asn Pro Leu Phe Leu
    255                 260                 265

gac gag cag ctg acc cgc gcc gaa ttc cag cgc atc acc cag gat ctg      867
Asp Glu Gln Leu Thr Arg Ala Glu Phe Gln Arg Ile Thr Gln Asp Leu
270                 275                 280                 285

ctg gac cgc acc cgt cag ccg ttc aag tcg gtg atc gcc gac gcc ggc      915
Leu Asp Arg Thr Arg Gln Pro Phe Lys Ser Val Ile Ala Asp Ala Gly
                290                 295                 300

atc tcg gtg tcc gac atc gac cac gtg gtg ctg gtg ggt ggt tcc acc      963
Ile Ser Val Ser Asp Ile Asp His Val Val Leu Val Gly Gly Ser Thr
            305                 310                 315

cgg atg ccc gcg gtg acc gac ctg gtc aag gaa ctc acc ggc ggc aag     1011
Arg Met Pro Ala Val Thr Asp Leu Val Lys Glu Leu Thr Gly Gly Lys
        320                 325                 330

gag ccc aac aag ggc gtc aac ccc gac gag gtt gtc gcg gtg ggt gcc     1059
Glu Pro Asn Lys Gly Val Asn Pro Asp Glu Val Val Ala Val Gly Ala
    335                 340                 345

gcc ctg cag gcc ggt gtg ctt aag ggc gag gtg aaa gac gtt ctg ctg     1107
Ala Leu Gln Ala Gly Val Leu Lys Gly Glu Val Lys Asp Val Leu Leu
350                 355                 360                 365

ctt gac gtt acg ccg ctg agc ctg ggt atc gag acc aag ggt ggc gtg     1155
Leu Asp Val Thr Pro Leu Ser Leu Gly Ile Glu Thr Lys Gly Gly Val
                370                 375                 380

atg acc aag ctg atc gaa cgc aac acc acc atc ccg acc aag cgg tcc     1203
Met Thr Lys Leu Ile Glu Arg Asn Thr Thr Ile Pro Thr Lys Arg Ser
            385                 390                 395

gag acg ttc acc acg gcc gac gac aac cag ccg tcg gtg cag atc cag     1251
Glu Thr Phe Thr Thr Ala Asp Asp Asn Gln Pro Ser Val Gln Ile Gln
        400                 405                 410

gtg tat cag ggt gag cgc gaa atc gcc gcg cac aac aag ctg ctc ggc     1299
Val Tyr Gln Gly Glu Arg Glu Ile Ala Ala His Asn Lys Leu Leu Gly
    415                 420                 425

tcc ttc gag ctg acc gga att ccg ccg gcg ccc cgc ggc gtg ccg cag     1347
```

```
Ser Phe Glu Leu Thr Gly Ile Pro Pro Ala Pro Arg Gly Val Pro Gln
430                 435                 440                 445

atc gag gtc acc ttc gac atc gac gcc aac ggc atc gtg cac gtc acc      1395
Ile Glu Val Thr Phe Asp Ile Asp Ala Asn Gly Ile Val His Val Thr
                450                 455                 460

gcc aag gac aag ggc acc ggt aag gag aac acg atc aag atc cag gag      1443
Ala Lys Asp Lys Gly Thr Gly Lys Glu Asn Thr Ile Lys Ile Gln Glu
            465                 470                 475

ggc tcc ggc ctg tcc aag gag gag atc gac cgg atg atc aag gac gcc      1491
Gly Ser Gly Leu Ser Lys Glu Glu Ile Asp Arg Met Ile Lys Asp Ala
        480                 485                 490

gag gcg cac gcc gag gag gac cgc aag agg cgc gag gaa gcc gac gtc      1539
Glu Ala His Ala Glu Glu Asp Arg Lys Arg Arg Glu Glu Ala Asp Val
    495                 500                 505

cgc aac caa gcg gaa tcg ctt gtc tac cag acg gag aag ttc gtc aag      1587
Arg Asn Gln Ala Glu Ser Leu Val Tyr Gln Thr Glu Lys Phe Val Lys
510                 515                 520                 525

gac cag cgc gag gcc gag ggc ggc tcg aag gtt ccc gag gag acg ctg      1635
Asp Gln Arg Glu Ala Glu Gly Gly Ser Lys Val Pro Glu Glu Thr Leu
                530                 535                 540

tcc aag gtc gac gcc gcg atc gcc gac gcc aag acg gcc ctg ggc ggc      1683
Ser Lys Val Asp Ala Ala Ile Ala Asp Ala Lys Thr Ala Leu Gly Gly
            545                 550                 555

acc gac atc acc gcg atc aag tcg gcg atg gag aag ctc ggc cag gag      1731
Thr Asp Ile Thr Ala Ile Lys Ser Ala Met Glu Lys Leu Gly Gln Glu
        560                 565                 570

tcg caa gcg ctg gga cag gca atc tac gag gcc acc cag gcc gag tcc      1779
Ser Gln Ala Leu Gly Gln Ala Ile Tyr Glu Ala Thr Gln Ala Glu Ser
    575                 580                 585

gcc cag gct ggc ggg ccg gac ggt gcc gcg gcc ggc ggc ggg tcc gga      1827
Ala Gln Ala Gly Gly Pro Asp Gly Ala Ala Ala Gly Gly Gly Ser Gly
590                 595                 600                 605

tcc gcc gac gat gtt gtg gac gcg gag gtg gtc gac gat gac cgg gag      1875
Ser Ala Asp Asp Val Val Asp Ala Glu Val Val Asp Asp Asp Arg Glu
                610                 615                 620

tcc aag tga                                                         1884
Ser Lys
```

<210> 20
<211> 623
<212> PRT
<213> Mycobacterium avium

<400> 20

```
Met Ala Arg Ala Val Gly Ile Asp Leu Gly Thr Thr Asn Ser Val Val
1               5                   10                  15

Ala Val Leu Glu Gly Gly Asp Pro Val Val Val Ala Asn Ser Glu Gly
                                    20
```

20 25 30

Ser Arg Thr Thr Pro Ser Ile Val Ala Phe Ala Arg Asn Gly Glu Val
35 40 45

Leu Val Gly Gln Pro Ala Lys Asn Gln Ala Val Thr Asn Val Asp Arg
50 55 60

Thr Ile Arg Ser Val Lys Arg His Met Gly Thr Asp Trp Ser Ile Glu
65 70 75 80

Ile Asp Gly Lys Lys Tyr Thr Ala Gln Glu Ile Ser Ala Arg Val Leu
85 90 95

Met Lys Leu Lys Arg Asp Ala Glu Ala Tyr Leu Gly Glu Asp Ile Thr
100 105 110

Asp Ala Val Ile Thr Val Pro Ala Tyr Phe Asn Asp Ala Gln Arg Gln
115 120 125

Ala Thr Lys Glu Ala Gly Gln Ile Ala Gly Leu Asn Val Leu Arg Ile
130 135 140

Val Asn Glu Pro Thr Ala Ala Ala Leu Ala Tyr Gly Leu Asp Lys Gly
145 150 155 160

Glu Lys Glu Gln Thr Ile Leu Val Phe Asp Leu Gly Gly Gly Thr Phe
165 170 175

Asp Val Ser Leu Leu Glu Ile Gly Glu Gly Val Val Glu Val Arg Ala
180 185 190

Thr Ser Gly Asp Asn Gln Leu Gly Gly Asp Asp Trp Asp Asp Arg Ile
195 200 205

Val Asn Trp Leu Val Asp Lys Phe Lys Gly Thr Ser Gly Ile Asp Leu
210 215 220

Thr Lys Asp Lys Met Ala Met Gln Arg Leu Arg Glu Ala Ala Glu Lys
225 230 235 240

Ala Lys Ile Glu Leu Ser Ser Ser Gln Ser Thr Ser Ile Asn Leu Pro
245 250 255

Tyr Ile Thr Val Asp Ala Asp Lys Asn Pro Leu Phe Leu Asp Glu Gln
260 265 270

Leu Thr Arg Ala Glu Phe Gln Arg Ile Thr Gln Asp Leu Leu Asp Arg

275 280 285

Thr Arg Gln Pro Phe Lys Ser Val Ile Ala Asp Ala Gly Ile Ser Val
290 295 300

Ser Asp Ile Asp His Val Val Leu Val Gly Gly Ser Thr Arg Met Pro
305 310 315 320

Ala Val Thr Asp Leu Val Lys Glu Leu Thr Gly Gly Lys Glu Pro Asn
325 330 335

Lys Gly Val Asn Pro Asp Glu Val Val Ala Val Gly Ala Ala Leu Gln
340 345 350

Ala Gly Val Leu Lys Gly Glu Val Lys Asp Val Leu Leu Leu Asp Val
355 360 365

Thr Pro Leu Ser Leu Gly Ile Glu Thr Lys Gly Gly Val Met Thr Lys
370 375 380

Leu Ile Glu Arg Asn Thr Thr Ile Pro Thr Lys Arg Ser Glu Thr Phe
385 390 395 400

Thr Thr Ala Asp Asp Asn Gln Pro Ser Val Gln Ile Gln Val Tyr Gln
405 410 415

Gly Glu Arg Glu Ile Ala Ala His Asn Lys Leu Leu Gly Ser Phe Glu
420 425 430

Leu Thr Gly Ile Pro Pro Ala Pro Arg Gly Val Pro Gln Ile Glu Val
435 440 445

Thr Phe Asp Ile Asp Ala Asn Gly Ile Val His Val Thr Ala Lys Asp
450 455 460

Lys Gly Thr Gly Lys Glu Asn Thr Ile Lys Ile Gln Glu Gly Ser Gly
465 470 475 480

Leu Ser Lys Glu Glu Ile Asp Arg Met Ile Lys Asp Ala Glu Ala His
485 490 495

Ala Glu Glu Asp Arg Lys Arg Arg Glu Glu Ala Asp Val Arg Asn Gln
500 505 510

Ala Glu Ser Leu Val Tyr Gln Thr Glu Lys Phe Val Lys Asp Gln Arg
515 520 525

Glu Ala Glu Gly Gly Ser Lys Val Pro Glu Glu Thr Leu Ser Lys Val

530 535 540

Asp Ala Ala Ile Ala Asp Ala Lys Thr Ala Leu Gly Gly Thr Asp Ile
545 550 555 560

Thr Ala Ile Lys Ser Ala Met Glu Lys Leu Gly Gln Glu Ser Gln Ala
565 570 575

Leu Gly Gln Ala Ile Tyr Glu Ala Thr Gln Ala Glu Ser Ala Gln Ala
580 585 590

Gly Gly Pro Asp Gly Ala Ala Ala Gly Gly Gly Ser Gly Ser Ala Asp
595 600 605

Asp Val Val Asp Ala Glu Val Val Asp Asp Asp Arg Glu Ser Lys
610 615 620

<210> 21
<211> 1701
<212> DNA
<213> Mycobacterium avium

<220>
<221> CDS
<222> (76)..(1701)

<400> 21
gcagcctggt cgtccgtcgc gggcactgca cccggccagg acgtgtcatc cccaatccgg 60

aggaatcact tcgca atg gcc aag aca att gcg tac gac gaa gag gcc cgt 111
Met Ala Lys Thr Ile Ala Tyr Asp Glu Glu Ala Arg
1 5 10

cgc ggc ctc gag cgg ggg ctc aac gcc ctc gcc gac gcg gta aag gtc 159
Arg Gly Leu Glu Arg Gly Leu Asn Ala Leu Ala Asp Ala Val Lys Val
15 20 25

acg ttg ggc ccc aag ggt cgc aac gtc gtc ctg gag aag aag tgg ggt 207
Thr Leu Gly Pro Lys Gly Arg Asn Val Val Leu Glu Lys Lys Trp Gly
30 35 40

gcc ccc acg atc acc aac gat ggt gtg tcc atc gcc aag gag atc gag 255
Ala Pro Thr Ile Thr Asn Asp Gly Val Ser Ile Ala Lys Glu Ile Glu
45 50 55 60

ctg gag gac ccg tac gag aag atc ggc gcc gag ctg gtc aag gaa gtc 303
Leu Glu Asp Pro Tyr Glu Lys Ile Gly Ala Glu Leu Val Lys Glu Val
65 70 75

gcc aag aag acc gac gac gtc gcc ggt gac ggc acg acg acg gcc acg 351
Ala Lys Lys Thr Asp Asp Val Ala Gly Asp Gly Thr Thr Thr Ala Thr
80 85 90

gtg ctc gcc cag gcg ttg gtc cgc gag ggc ctg cgc aac gtc gcg gcc 399
Val Leu Ala Gln Ala Leu Val Arg Glu Gly Leu Arg Asn Val Ala Ala
95 100 105

```
ggc gcc aac ccg ctg ggt ctc aag cgc ggc atc gag aag gcc gtc gag      447
Gly Ala Asn Pro Leu Gly Leu Lys Arg Gly Ile Glu Lys Ala Val Glu
    110                 115                 120

aag gtc acc gag acc ctg ctc aag tcg gcc aag gag gtc gag acc aag      495
Lys Val Thr Glu Thr Leu Leu Lys Ser Ala Lys Glu Val Glu Thr Lys
125                 130                 135                 140

gac cag atc gct gcc acc gcg gcc atc tcc gcg ggc gac cag tcg atc      543
Asp Gln Ile Ala Ala Thr Ala Ala Ile Ser Ala Gly Asp Gln Ser Ile
                145                 150                 155

ggc gac ctg atc gcc gag gcg atg gac aag gtc ggc aac gag ggc gtc      591
Gly Asp Leu Ile Ala Glu Ala Met Asp Lys Val Gly Asn Glu Gly Val
            160                 165                 170

atc acc gtc gag gag tcc aac acc ttc ggc ctg cag ctc gag ctc acc      639
Ile Thr Val Glu Glu Ser Asn Thr Phe Gly Leu Gln Leu Glu Leu Thr
        175                 180                 185

gag ggt atg cgg ttc gac aag ggt tac atc tcg ggc tac ttc gtc acg      687
Glu Gly Met Arg Phe Asp Lys Gly Tyr Ile Ser Gly Tyr Phe Val Thr
    190                 195                 200

gac gcc gag cgt cag gaa gcg gtc ctc gag gac ccg ttc atc ctg ctg      735
Asp Ala Glu Arg Gln Glu Ala Val Leu Glu Asp Pro Phe Ile Leu Leu
205                 210                 215                 220

gtc agc tcc aag gtc tcg acc gtc aag gac ctg ctg ccg ctg ctg gag      783
Val Ser Ser Lys Val Ser Thr Val Lys Asp Leu Leu Pro Leu Leu Glu
                225                 230                 235

aag gtc atc cag gcc ggc aag ccg ctg ctg atc atc gcc gag gac gtc      831
Lys Val Ile Gln Ala Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Val
            240                 245                 250

gag ggc gag gcc ctg tcc acc ctg gtc gtc aac aag atc cgc ggc acc      879
Glu Gly Glu Ala Leu Ser Thr Leu Val Val Asn Lys Ile Arg Gly Thr
        255                 260                 265

ttc aag tcg gtg gcc gtc aag gcg ccc ggc ttc ggc gac cgc cgc aag      927
Phe Lys Ser Val Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys
    270                 275                 280

gcg atg ctt cag gac atg gcc atc ctc acc ggc ggc cag gtc atc agc      975
Ala Met Leu Gln Asp Met Ala Ile Leu Thr Gly Gly Gln Val Ile Ser
285                 290                 295                 300

gaa gag gtc ggc ctg tcg ctg gag agc gcc gac atc tcg ctg ctc ggt     1023
Glu Glu Val Gly Leu Ser Leu Glu Ser Ala Asp Ile Ser Leu Leu Gly
                305                 310                 315

aag gcc cgc aag gtc gtc gtc acc aag gac gag acc acc atc gtc gag     1071
Lys Ala Arg Lys Val Val Val Thr Lys Asp Glu Thr Thr Ile Val Glu
            320                 325                 330

ggc gcc ggt gac tcc gac gcc atc gcc ggc cgg gtg gcc cag atc cgc     1119
Gly Ala Gly Asp Ser Asp Ala Ile Ala Gly Arg Val Ala Gln Ile Arg
        335                 340                 345

acc gag atc gag aac agc gac tcc gac tac gac cgc gag aag ctg cag     1167
Thr Glu Ile Glu Asn Ser Asp Ser Asp Tyr Asp Arg Glu Lys Leu Gln
    350                 355                 360
```

```
gag cgg ctg gcc aag ctg gcc ggc ggc gtg gcg gtg atc aag gcc ggc      1215
Glu Arg Leu Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Ala Gly
365                 370                 375                 380

gcc gcg acc gag gtc gag ctc aag gag cgc aag cac cgc atc gag gac      1263
Ala Ala Thr Glu Val Glu Leu Lys Glu Arg Lys His Arg Ile Glu Asp
                385                 390                 395

gcg gtc cgc aac gcc aag gcg gcc gtg gag gag ggc atc gtc gcc ggc      1311
Ala Val Arg Asn Ala Lys Ala Ala Val Glu Glu Gly Ile Val Ala Gly
            400                 405                 410

ggt ggc gtg gcc ctg ctg cac gcg atc ccg gct ctg gac gag ctg aag      1359
Gly Gly Val Ala Leu Leu His Ala Ile Pro Ala Leu Asp Glu Leu Lys
        415                 420                 425

ctc gag ggc gaa gag gcg acc ggc gcc aac atc gtc cgg gtg gcc ctc      1407
Leu Glu Gly Glu Glu Ala Thr Gly Ala Asn Ile Val Arg Val Ala Leu
    430                 435                 440

gag gct ccg ctg aag cag atc gcc ttc aac ggt ggc ctg gag ccc ggc      1455
Glu Ala Pro Leu Lys Gln Ile Ala Phe Asn Gly Gly Leu Glu Pro Gly
445                 450                 455                 460

gtg gtg gcc gag aag gtc cgc aac tcg ccc gcc ggt acc ggc ctc aac      1503
Val Val Ala Glu Lys Val Arg Asn Ser Pro Ala Gly Thr Gly Leu Asn
                465                 470                 475

gcc gcc acc ggt gag tac gag gac ctg ctc aag gcc ggc att gcc gac      1551
Ala Ala Thr Gly Glu Tyr Glu Asp Leu Leu Lys Ala Gly Ile Ala Asp
            480                 485                 490

ccg gtg aag gtc acc cgc tcg gcg ctg cag aac gcg gcg tcc atc gcg      1599
Pro Val Lys Val Thr Arg Ser Ala Leu Gln Asn Ala Ala Ser Ile Ala
        495                 500                 505

ggg ctg ttc ctg acc acc gag gcg gtc gtc gcc gac aag ccg gag aag      1647
Gly Leu Phe Leu Thr Thr Glu Ala Val Val Ala Asp Lys Pro Glu Lys
    510                 515                 520

gcg gcc gct ccc gcg ggc gac ccg acc ggc ggc atg ggc ggc atg gac      1695
Ala Ala Ala Pro Ala Gly Asp Pro Thr Gly Gly Met Gly Gly Met Asp
525                 530                 535                 540

                                                                    1701
ttc tga
Phe
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<210> 22
<211> 541
<212> PRT
<213> Mycobacterium avium

<400> 22

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Arg Gly Leu Asn Ala Leu Ala Asp Ala Val Lys Val Thr Leu Gly Pro
            20                  25                  30
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Lys Gly Arg Asn Val Val Leu Glu Lys Lys Trp Gly Ala Pro Thr Ile
35 40 45

Thr Asn Asp Gly Val Ser Ile Ala Lys Glu Ile Glu Leu Glu Asp Pro
50 55 60

Tyr Glu Lys Ile Gly Ala Glu Leu Val Lys Glu Val Ala Lys Lys Thr
65 70 75 80

Asp Asp Val Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala Gln
85 90 95

Ala Leu Val Arg Glu Gly Leu Arg Asn Val Ala Ala Gly Ala Asn Pro
100 105 110

Leu Gly Leu Lys Arg Gly Ile Glu Lys Ala Val Glu Lys Val Thr Glu
115 120 125

Thr Leu Leu Lys Ser Ala Lys Glu Val Glu Thr Lys Asp Gln Ile Ala
130 135 140

Ala Thr Ala Ala Ile Ser Ala Gly Asp Gln Ser Ile Gly Asp Leu Ile
145 150 155 160

Ala Glu Ala Met Asp Lys Val Gly Asn Glu Gly Val Ile Thr Val Glu
165 170 175

Glu Ser Asn Thr Phe Gly Leu Gln Leu Glu Leu Thr Glu Gly Met Arg
180 185 190

Phe Asp Lys Gly Tyr Ile Ser Gly Tyr Phe Val Thr Asp Ala Glu Arg
195 200 205

Gln Glu Ala Val Leu Glu Asp Pro Phe Ile Leu Leu Val Ser Ser Lys
210 215 220

Val Ser Thr Val Lys Asp Leu Leu Pro Leu Leu Glu Lys Val Ile Gln
225 230 235 240

Ala Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Val Glu Gly Glu Ala
245 250 255

Leu Ser Thr Leu Val Val Asn Lys Ile Arg Gly Thr Phe Lys Ser Val
260 265 270

Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met Leu Gln
275 280 285

Asp Met Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu Val Gly
290 295 300

Leu Ser Leu Glu Ser Ala Asp Ile Ser Leu Leu Gly Lys Ala Arg Lys
305 310 315 320

Val Val Val Thr Lys Asp Glu Thr Thr Ile Val Glu Gly Ala Gly Asp
325 330 335

Ser Asp Ala Ile Ala Gly Arg Val Ala Gln Ile Arg Thr Glu Ile Glu
340 345 350

Asn Ser Asp Ser Asp Tyr Asp Arg Glu Lys Leu Gln Glu Arg Leu Ala
355 360 365

Lys Leu Ala Gly Gly Val Ala Val Ile Lys Ala Gly Ala Ala Thr Glu
370 375 380

Val Glu Leu Lys Glu Arg Lys His Arg Ile Glu Asp Ala Val Arg Asn
385 390 395 400

Ala Lys Ala Ala Val Glu Glu Gly Ile Val Ala Gly Gly Gly Val Ala
405 410 415

Leu Leu His Ala Ile Pro Ala Leu Asp Glu Leu Lys Leu Glu Gly Glu
420 425 430

Glu Ala Thr Gly Ala Asn Ile Val Arg Val Ala Leu Glu Ala Pro Leu
435 440 445

Lys Gln Ile Ala Phe Asn Gly Gly Leu Glu Pro Gly Val Val Ala Glu
450 455 460

Lys Val Arg Asn Ser Pro Ala Gly Thr Gly Leu Asn Ala Ala Thr Gly
465 470 475 480

Glu Tyr Glu Asp Leu Leu Lys Ala Gly Ile Ala Asp Pro Val Lys Val
485 490 495

Thr Arg Ser Ala Leu Gln Asn Ala Ala Ser Ile Ala Gly Leu Phe Leu
500 505 510

Thr Thr Glu Ala Val Val Ala Asp Lys Pro Glu Lys Ala Ala Ala Pro
515 520 525

Ala Gly Asp Pro Thr Gly Gly Met Gly Gly Met Asp Phe
530 535 540